Virtualization

- Server virtualization
- Desktop virtualization

What's in the data room?

Businesses maintain groups of servers on-site to fulfill various business needs including:

- Network Servers / Domain Controllers
- File Storage
- Application Servers (CRM, ERP, Databases, Billing)
- Web Servers (Hosting of web sites and applications)

These servers consume the same resources that any on-site IT resource consumes:

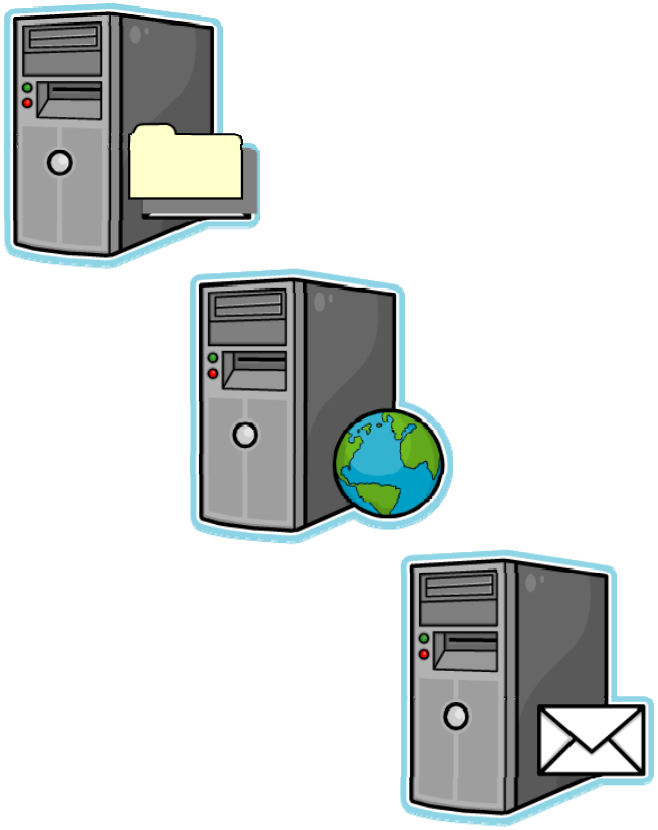
- Space, Power, Cooling, Administrative time, Maintenance Fees, Capex

What's missing from the data room?

- These on-site servers generally need, but do not always get:
  - Fire Suppression
  - Backup Power
  - Failover / Redundant equipment
  - Monitoring
  - 24x7 support

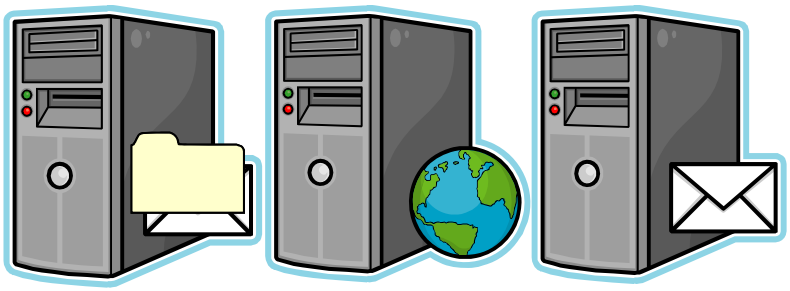
Traditional Server Environments

- One Server for One Application
- File Server
- Web Server
- Mail Server

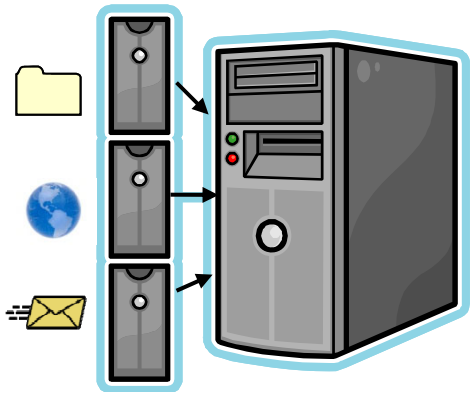


Server Virtualization Pictorial

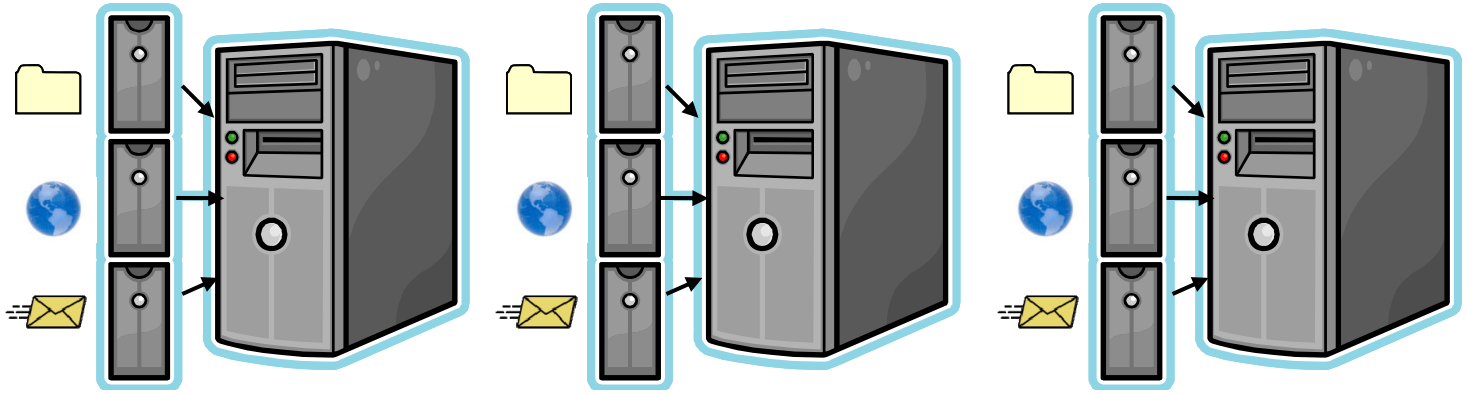
Typical Model:
One Server, One Application



Virtual Machine:
ONE server, Multiple Applications



Virtual Infrastructure:
Multiple Servers, Multiple and REDUNDANT Applications



Traditional Desktop Environments

- Each employee uses a desktop or laptop that IT must maintain.
- Ability to run software is based on the equipment on which it is installed.
- Local disk stores OS, applications and data.
- Upgrades and software are deployed on a one to one basis.

Desktop Virtualization Pictorial

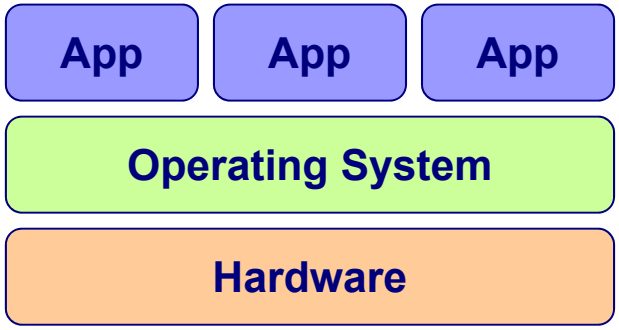
Typical Desktop:
One Desktop, One OS, One Employee

Virtual Desktop:
Access to a single desktop, from any device

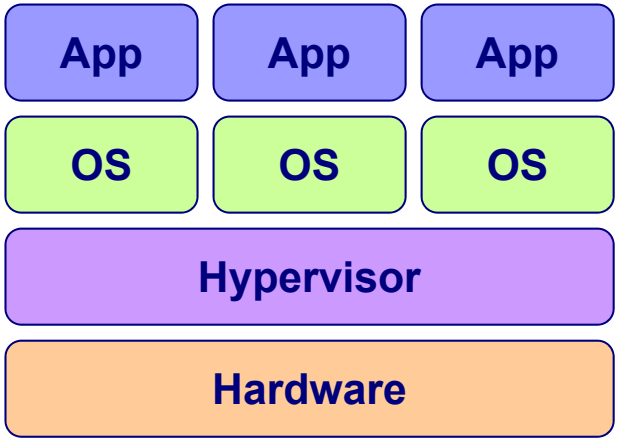
Top Reasons to Consider Desktop Virtualization

- Economics – Reduce the total cost of desktop ownership by almost 70% through remote troubleshooting, ease of deployment, and extended life of older equipment.
- Productivity – Users can gain access to their desktop from any location on any device, while administrators can support and deploy from a centralized location.
- Scalability – Meet new requirements by adding additional resources to the “virtual” PC rather than upgrading equipment
- Performance – Immediately rectify PC problems by remotely restarting, or reimaging the desktop saving IT time and putting employees back to work immediately.
- Security – Provide external users with secure access to company apps and data. Enforce end-to-end security, consistently, across all users, regardless of device.

Key Technology: Virtualization



Traditional Stack



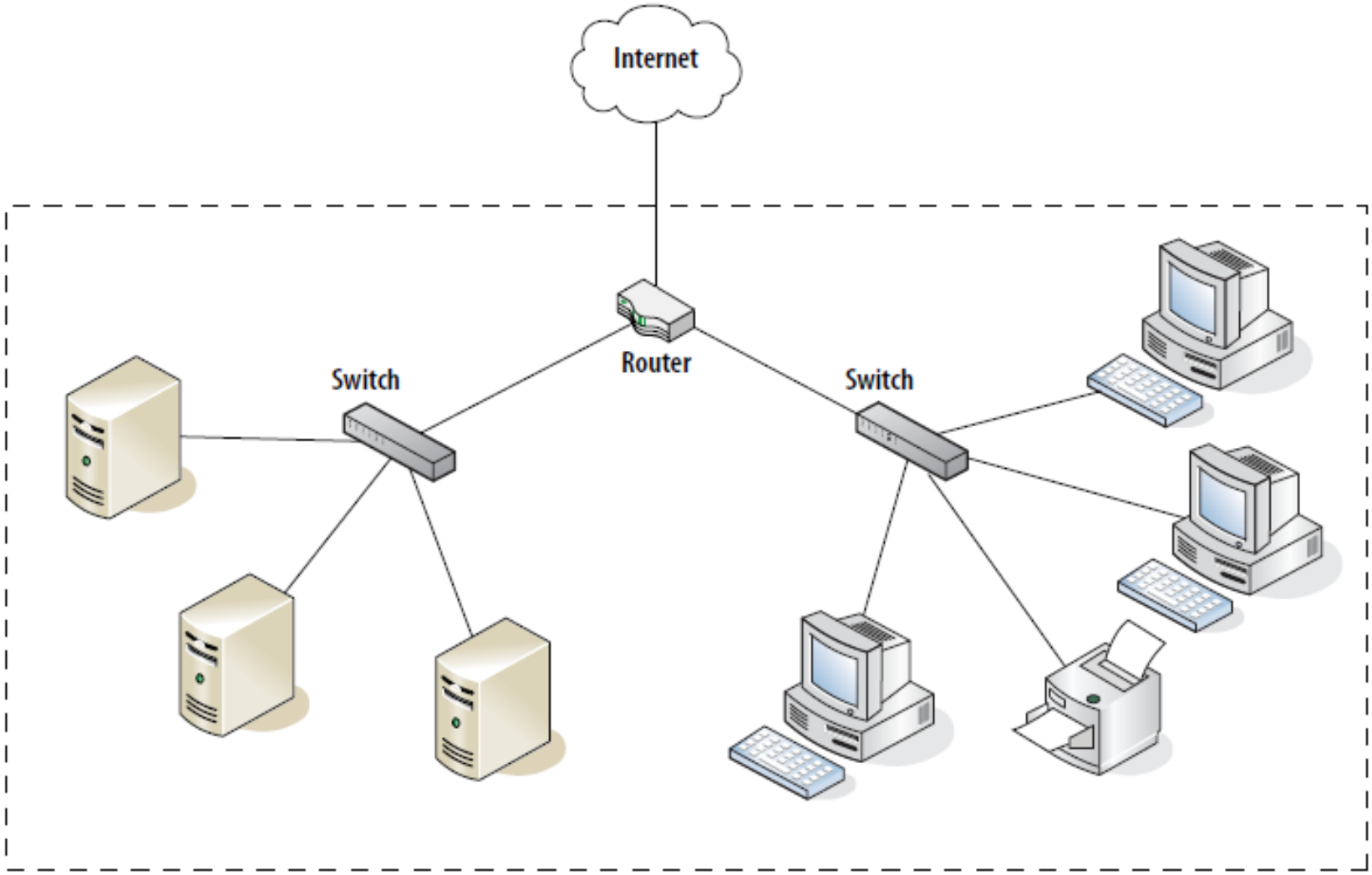
Virtualized Stack

- VmWare ESXi
- Microsoft HyperV
- Citrix XEN

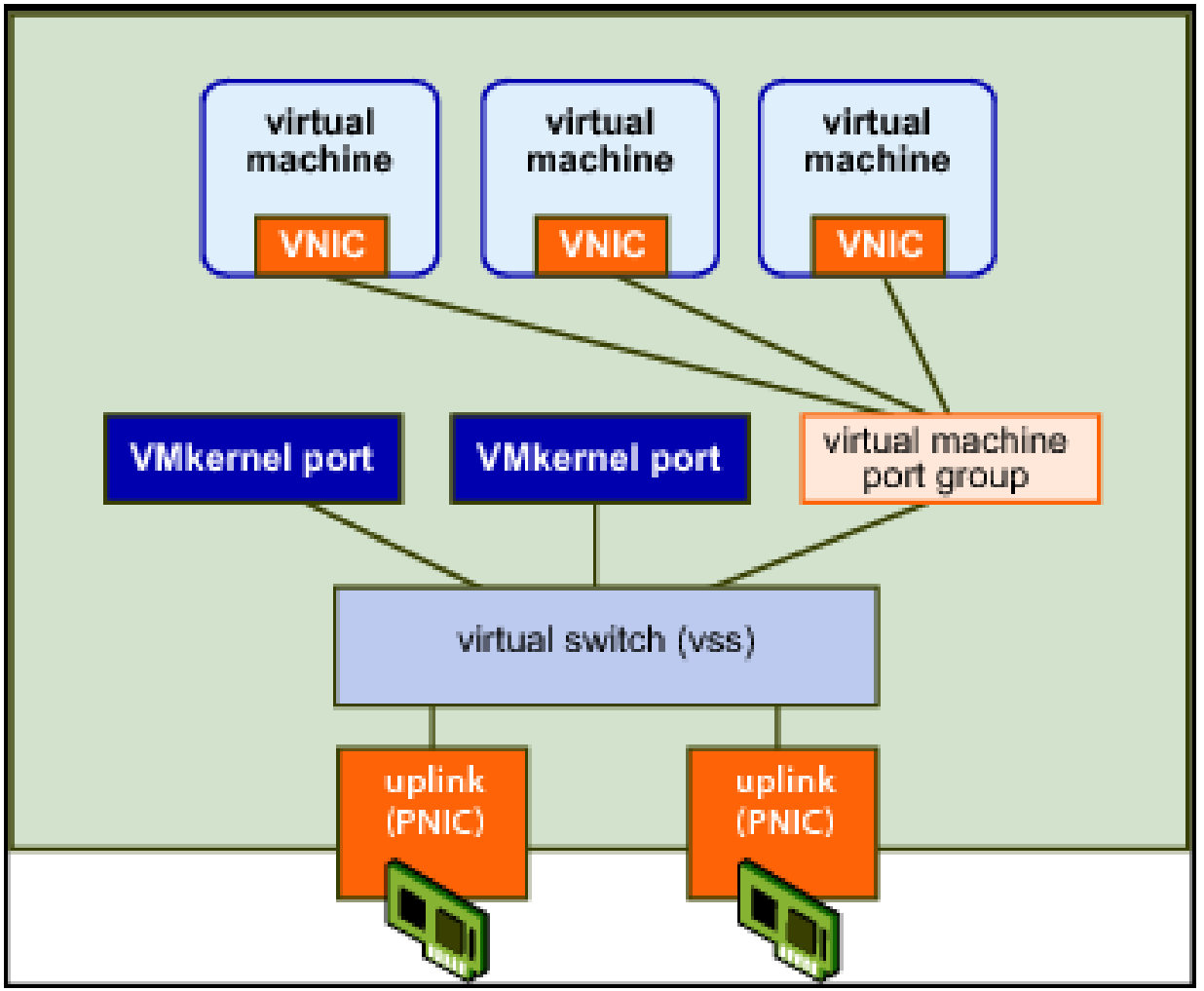
Network Challenges

- Network node count
- Number of hops
- Transport protocol latency
- Network congestion

Traditional data center connectivity



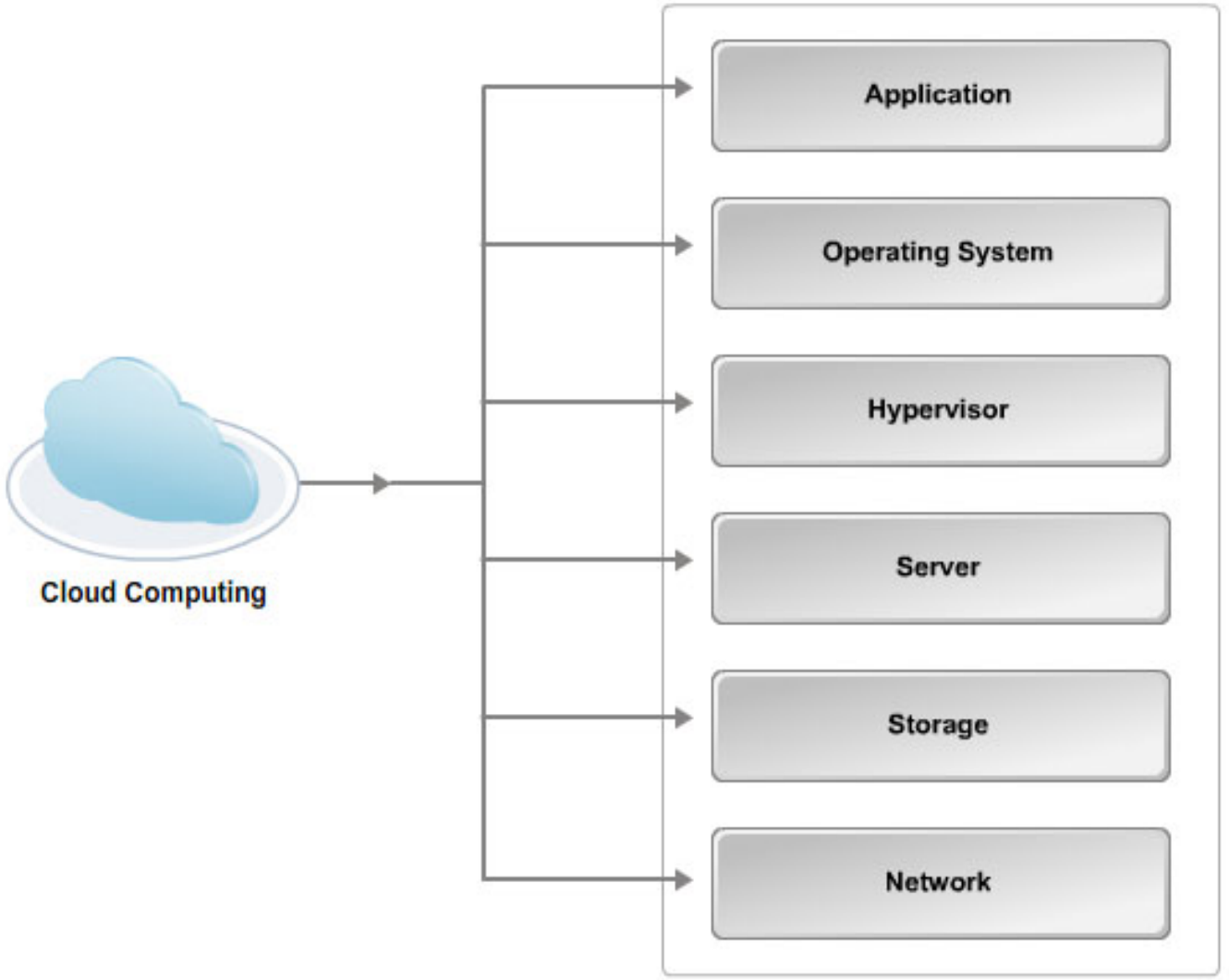
Switching between virtual machines



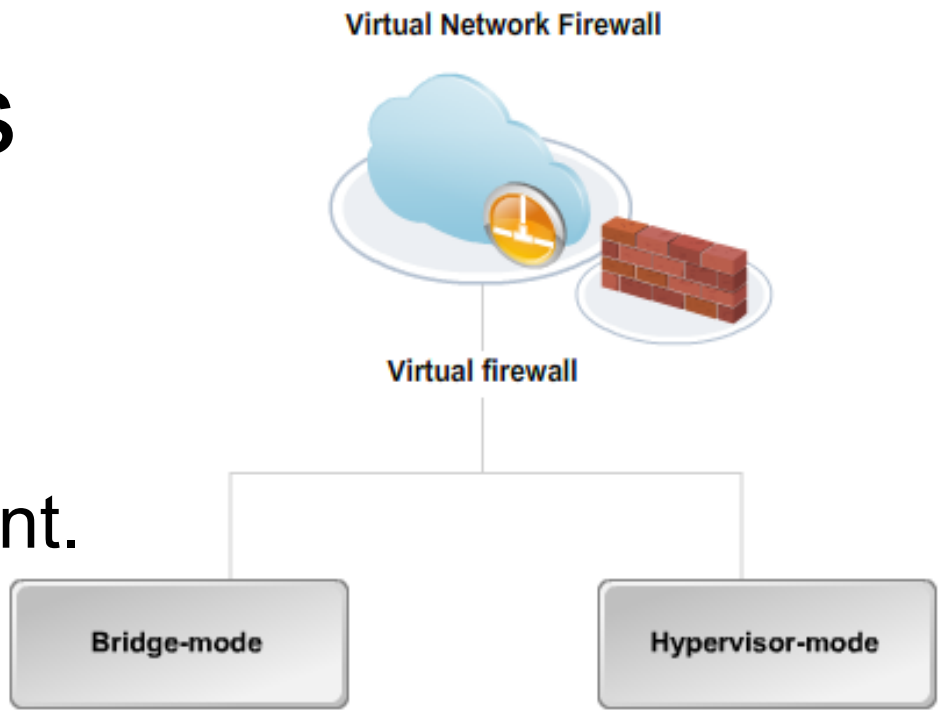
VXLAN

- Vendors such as Intel, VMware, Arista, and Broadcom have developed a technology that creates Layer 2 tunnels, the Virtual Extensible Local Area Network (VXLAN). VXLAN is an example of software-defined cloud networking (SDCN). Fundamentally, VXLAN provides Layer 2 tunneling connections between cloud services separated by Layer 3 network segmentation.

Cloud Network



Virtual Firewalls

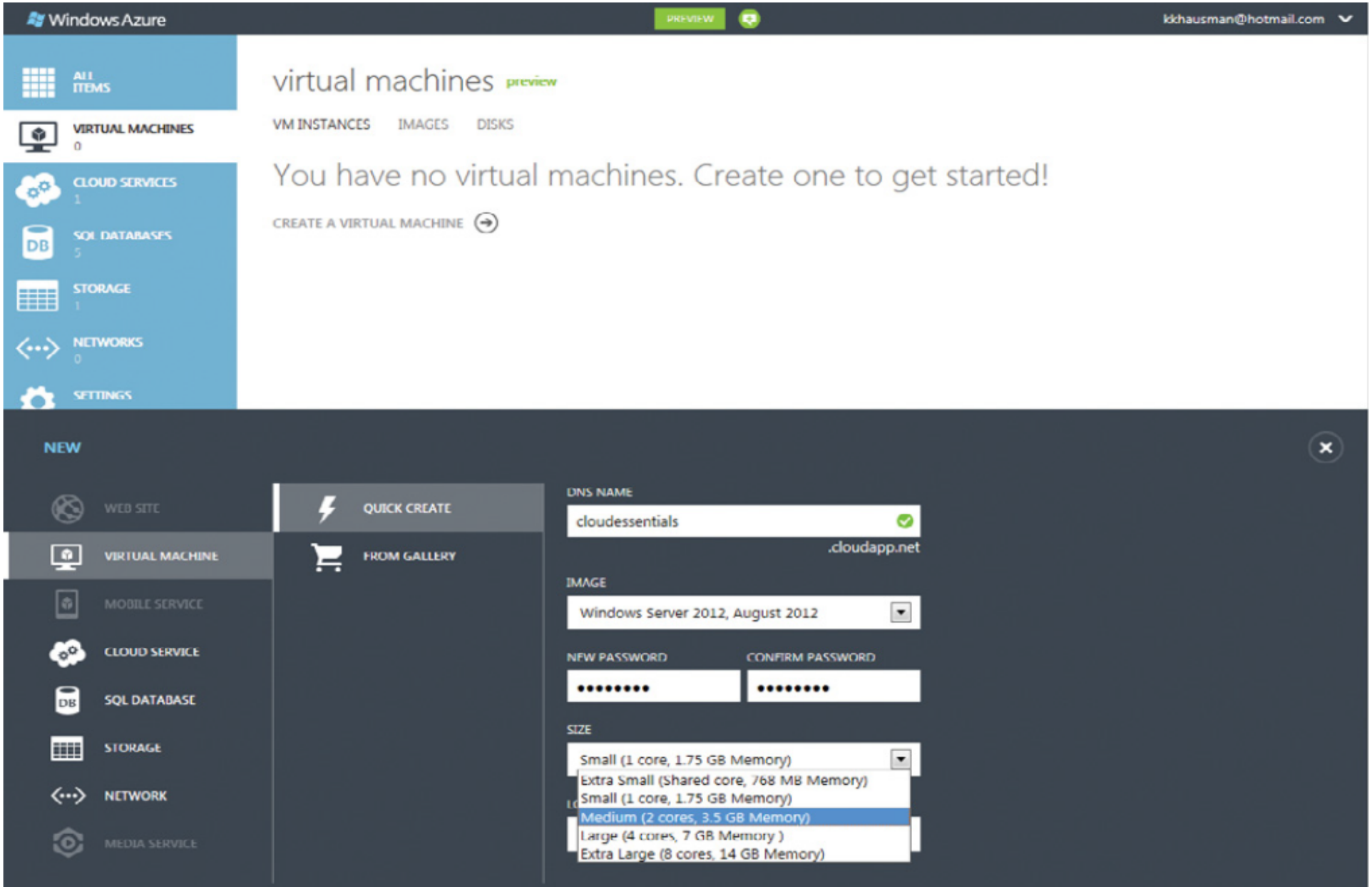


- Virtual firewall is a software, used to monitor and control resources in virtual network environment.
- Can operate in bridge mode between VM's inspecting packets from and to different IP addresses
- In Hypervisor mode it is built in the hypervisor and captures traffic from virtual machines in order to monitor data

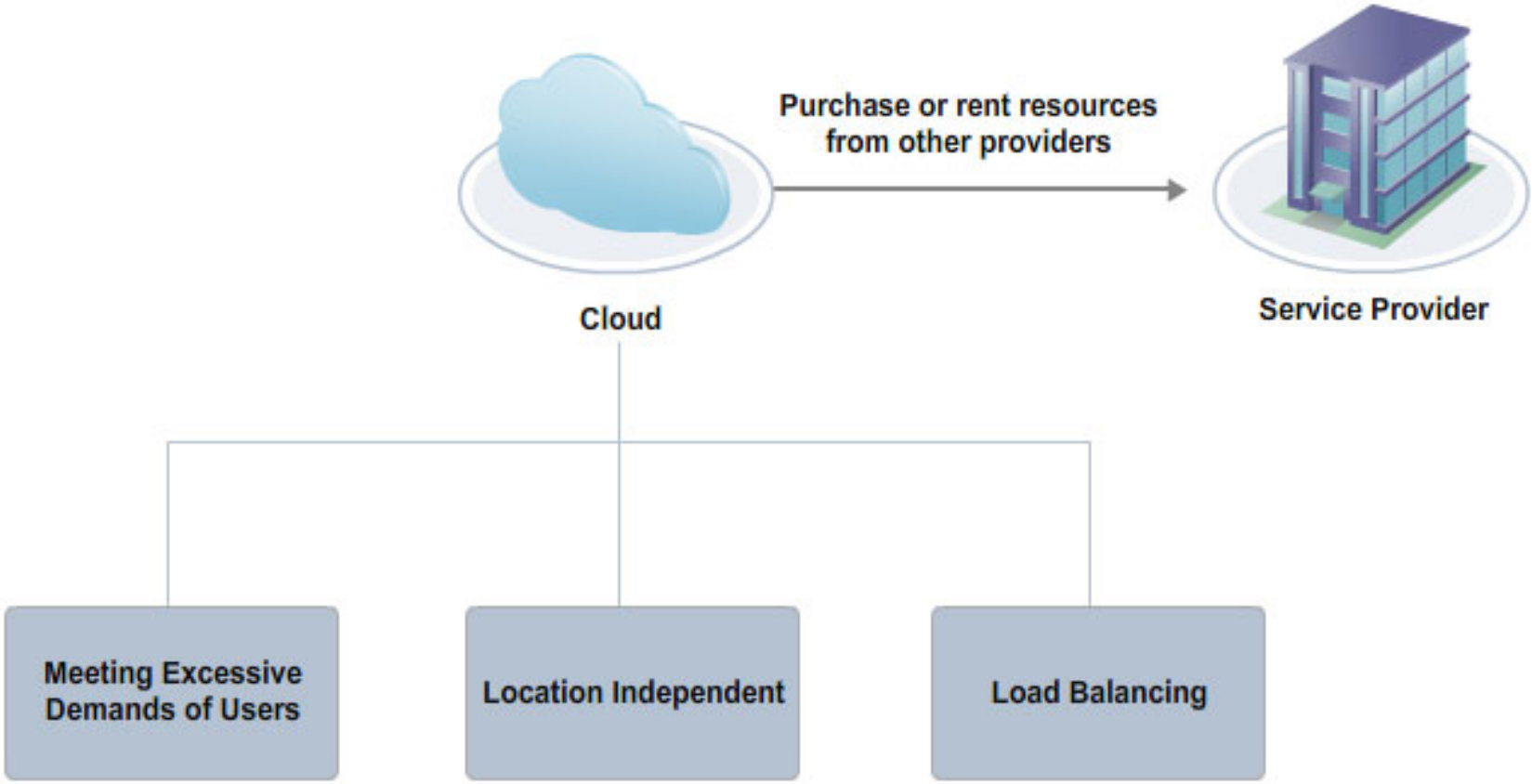
Automation of Operations on Cloud

- The task of managing and provisioning infrastructure (IaaS), such a servers, network and storage, while centralizing the norms for security and usage
- The scope of Multi-tenancy (SaaS), which is an added advantage, whereby multiple organizations can not only access an instance of software residing on a server, but also access databases and packaged applications
- A highly flexible architecture with advanced workload optimization and metering, service assurance, application lifecycle management, security and compliance

Microsoft Azure IaaS



Federated Cloud Services



CloudSwitch

A software appliance that make it possible to migrate services such as cloud-hosted virtual machines between private and public cloud hosting through the same type of web client

Researcher – real life example

- PhD student in Medicine for his PhD thesis has to analyze and render with 3D software hundreds of thousands X-ray images. She has to finish her PhD work in 3 years, and the real analysis and modeling is scheduled for 6 months.
- For the research she needs four servers, each costs about 4000 EUR and a shared storage which costs 7000 EUR – total of 23000 EUR.
- Instead she rented resources from a Bulgarian cloud provider.
- One server with 4 CPUs, 8 GB RAM and 5TB storage costs 0.75 EUR/hour with VAT included. Four servers cost 3 EUR/hour. She worked 6 months X 20 working days X 8 hours per working day X 3 EUR, which totals of 2880 EUR, and now she is a PhD.

Penetration tester – real life examp.

- For effective penetration test you need at least 2000, sometimes 5000 users against one penetrated system.
- One computer may simulate effectively about 100-200.
- So you need 10, sometimes 40-50 powerful computers with stable Internet connection to perform a test.
- Sometimes you need to change the source IP addresses, that is impossible when you test from a fixed location, except if you buy many addresses (already impossible).
- You provide 1 – 2 tests in a month for average 5000$
- If you own the equipment, you need to invest 50 PC's X 1000$ = 50000$, and to pay monthly Internet fee for about 500$
- In the cloud you need 0.1$ per machine per hour. One test typically takes about 4 to 8 hours against one server. = 40$

Cloud.bg (Oblak.bg)